WHAT IS CLAIMED IS:

[c1] A magnetizing coil unit comprising a coiled metal sheet solenoid adapted to magnetize a permanent magnet precursor body.

[c2] The magnetizing coil unit of claim 1, wherein:
the coiled metal sheet comprises copper;
a width of the coiled copper sheet is substantially equal to a height of the solenoid.

[c3] The magnetizing coil unit of claim 2, wherein the coil does not include any joints.

[c4] The magnetizing coil unit of claim 2, wherein the coil is pancaked wrapped.

[c5] The magnetizing coil unit of claim 2, further comprising an insulation layer wound between successive copper layers in the coiled copper sheet.

[c6] The method of claim 5, wherein the insulating layer is a solid or a porous sheet.

[c7] The magnetizing coil unit of claim 2, wherein the coil is located in a housing, the housing containing a coolant input port in a bottom of the housing, a plurality of microchannels in the coolant input port, a coolant output port located in a top of the housing, and a plurality of microchannels in the coolant output port.

[c8] The magnetizing coil unit of claim 7, wherein the coolant is adapted to move from the input port to the output port through a space between windings of the coiled copper sheet.

[c9] The magnetizing coil unit of claim 7, wherein the coolant is adapted to move from the input port to the output port through a porous insulation layer located between windings of the copper coiled sheet.

[c10] The magnetizing coil unit of claim 7, wherein a number of microchannels is approximately equal to a number of windings in the coiled copper sheet.

[c11] A magnetizing assembly comprising a plurality of magnetizing coil units, each of the magnetizing coil units comprising a coiled copper sheet located in a housing, the housing containing a coolant input port in a bottom of the housing, a plurality of microchannels in the coolant input port, a coolant output port located in a top of the housing, and a plurality of microchannels in the coolant output port.

[c12] The magnetizing assembly of claim 11, further comprising a coolant reservoir in an outer portion of the magnetizing coil units.

[c13] The magnetizing assembly of claim 11, wherein the plurality of magnetizing coil units are stacked upon each other.

[c14] The magnetizing assembly of claim 13, wherein:

either a top portion or a bottom portion of each housing includes an opening or a protrusion; and

the protrusion on the housing of one magnetizing coil unit is adapted to fit into the opening on the housing of an adjacent magnetizing coil unit in the assembly.

[c15] The magnetizing assembly of claim 14, wherein the opening comprises a groove and the protrusion comprises a tongue.

[c16] The magnetizing assembly of claim 14, wherein the opening comprises a hole and the protrusion comprises a post.

[c17] A method of manufacturing a magnetizing coil comprising winding a copper sheet into a coil to form a solenoid coil, the width of the copper sheet being equal to the height of the solenoid coil.

[c18] The method of claim 17, further comprising inserting an insulation layer between windings of the copper coil.

[c19] The method of claim 18, wherein inserting the insulation layer comprises coating the copper sheet with an insulation layer before winding the copper sheet.

[c20] The method of claim 18, wherein inserting the insulating layer comprises co-winding an insulation layer with the copper sheet.

[c21] The method of claim 20, wherein the insulation layer is a solid or porous sheet.

[c22] The method of claim 19, wherein the insulation layer is spiral wrapped around the copper sheet.

[c23] The method of claim 19, further comprising locating the solenoid coil in a housing, the housing containing a coolant input port in a bottom of the housing, a plurality of microchannels in the coolant input port, a coolant output

port located in a top of the housing, and a plurality of microchannels in the coolant output port.

[c24] The method of claim 23, further comprising supplying a coolant to the cavity of the housing through the coolant input port.

[c25] A method of making a permanent magnet comprising:

surrounding an unmagnetized or partially magnetized precursor body with a least one magnetizing coil unit, the magnetizing coil unit comprising a coiled metal sheet solenoid; and

providing a pulsed magnetic field to the precursor body to form a permanent magnet body.

[c26] The method of claim 25, wherein the magnetizing coil unit is located in a housing comprising a coolant input port in a bottom of the housing, a plurality of microchannels in the coolant input port, a coolant output port located in a top of the housing, and a plurality of microchannels in the coolant output port.

[c27] The method of claim 26, further comprising supplying coolant to the magnetizing coil unit via the coolant input port during the pulsed magnetic field.

[c28] The method of claim 27, wherein the coolant is liquid nitrogen.

[c29] The method of claim 28, wherein the liquid nitrogen evaporates during the pulse and exits the housing as a gas.

[c30] The method of claim 26, further comprising using a plurality of magnetizing coil units to surround a plurality of unmagnetized or partially magnetized precursor bodies and to simultaneously magnetize the plurality of precursor bodies.

[c31] The method of claim 30, wherein the plurality of precursor bodies are attached to a yoke of an MRI system, and the plurality of housings are stacked on top of each other.

[c32] The method of claim 29, wherein the liquid nitrogen permeates in a space between the copper sheet windings.

[c33] The method of claim 29, wherein the liquid nitrogen permeates through a porous insulation layer located between the copper sheet windings.

[c34] The method of claim 31, wherein the permanent magnet body comprises a RMB alloy, where R comprises at least one rare earth element and M comprises iron.